MARINE REVIEW.

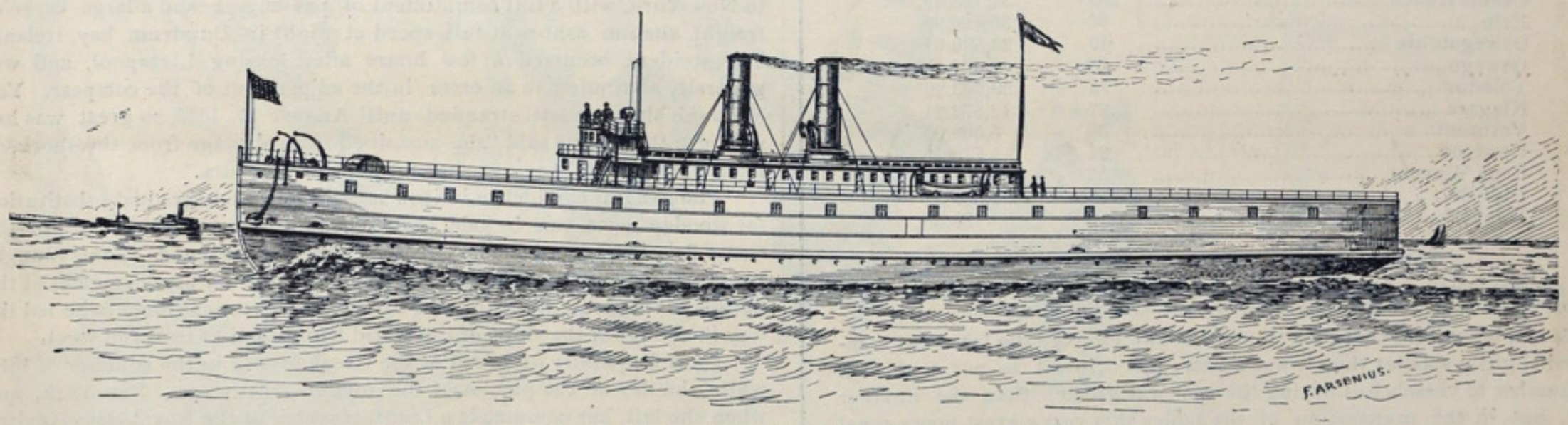
VOL. X. CLEVELAND, O., OCTOBER 4, 1894. No. 14.

Conneaut—Port Dover Car Ferries.

The several lake ship builders who have submitted bids for the construction of the two car ferries proposed for the Conneaut–Port Dover route are still awaiting the decison of the company regarding the contract. Two or three of them have visited the office of the company in New York since the bids were called for, but all have returned without the contract, and it is thought that Col. Dick and his associates in the project are delayed on account of funds at their command not being sufficient as yet to go ahead with construction of the boats.

A picture of one of the proposed ferries, made from the drawings that were sent out with specifications, is presented on this page. It will be seen that the type of boat proposed for the Lake Erie service is not of the powerful, ice-crushing kind represented by the Ste. Marie and St. Ignace, which are engaged in the Straits of Mackinac. The Lake Erie service will not require the strongest type of ice crusher, as only during January and February will any heavy ice be met with, and on this account there is no question of the practicability of the project, provided funds for the construction of the boats and costly terminals are forthcoming.

The boat represented by the engraving is 350 feet over all, 56 feet beam, 20 feet deep, moulded, and 27 feet deep from the upper deck to the bottom of the hold, and will be of steel up to the top of her rail, with wooden upper works. She will carry—on her main deck—thirty of the regular 30 or 24-foot cars, and they will be loaded at at the stern and will be completely housed in. Engines will be triple expansion, and combined they will develop 2,000 horse power. The cylinders will be 18½, 30 and 50 by 36 inches stroke. Steam will be furnished by four cylindrical boilers. Light will be furnished by 350 16-candle power electric lights, and there will also be a 6,000 candle power search light. The boats are intended to carry freight and passenger cars between Conneaut, O., and Port Dover, Ont., in connection with the Pittsqurgh, Shenango & Lake Erie road at the former port and the Grand Trunk at Port Dover. The run each way will be about 50 miles.



CAR FERRY FOR SERVICE BETWEEN CONNEAUT AND PORT DOVER, LAKE ERIE.

Protest Made in Behalf of the Ironton.

Although the collision on Lake Huron a few days ago, in which the steamer Ohio and schooner Ironton were both lost off Detour, may pass without a law suit, the protest made by representatives of the owners of the Ironton may prove interesting. No statement has been given out by either owners or crew of the steamer Ohio, but the full statement made by two of the surviving members of the crew of the schooner, William W. Parry and William Wooley, follows:

"We were in tow of the C. J. Kershaw, which also had the Moonlight in tow ahead of us, and all were light. About 1 o'clock on the morning of Wednesday, Sept. 26, the Ironton came into collision with the steamer Ohio and sank in Lake Huron as a result of the collision, and all hands were lost except the two seamen who make this protest. A little before midnight of Tuesday the 25th the Kershaw's engine broke down and we ran up on the vessels ahead so that our line was cast off by the Moonlight. The wind was fresh, southerly, with some sea making. We made sail, and got up steam on the pony to pull in the tow line. Our sail consisted of staysail, jib, foresail, mainsail and mizzen, under which we stood along on the port tack with our sailing lights properly set and burning. While we were getting in the tow line we saw the three lights of a steamer coming down. She was quite a distance off. The vessels at first were apparently about end on. As she approached, the lights of the steamer drew over on our starboard bow, so that from a quarter to half a mile away the steamer was standing as if to pass clear to starboard. We were engaged on deck getting in the tow line, and next noticed the propeller standing across our bow, from our lee bow up to windward, showing her port side mast head-light and red light with her green light shut out. The master of the Ironton gave the order to our helmsman hard-up. The vessels were then very close together. We were heading about for the pilot house or somewhere forward on the Ohio, and a moment later struck her port side about abreast of the boiler house. No change was made in the course of the Ironton until this order hard-up was given, after the steamer had hauled across our bow.

"We did not know what damage was done to the Ohio, and separated from her while we were making an examination of our own injuries. We sounded our pumps and examined over our bow with a lantern. Our stem was split, and some planks were broken above water on the port side. It first looked as though our injuries were all above water, but in a short time we found she was leaking badly. We started our steam pumps, got off one of the hatches and found the water was coming into hold freely; took off all the canvss but the mizzen, and brought her heading nearly into the wind and sea. The water continued to gain on the pumps in spite of everything we could do. We saw a propeller, which proved to be Hebard, coming up; blew our whistle for assistance and flashed our torch. We found the vessel was going to sink, and lowered our boat. One man was in the boat unhooking the tackles. We were just about getting the boat alongside to take the crew off the Ironton when the schooner gave a lurch and went down, dragging the yawl with her, and everyone was thrown into the water. We (the two survivors) got on the box or cover for the pony engine. Some of the others were seen on pieces of the wreckage, but the subscribers to this protest were the only two who were rescued and taken aboard the Hebard. The Ironton went down about twenty miles above Presque Isle in very deep water, and became an actual total loss."

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on Sept. 29, 1894:

	Wheat, bu.	Corn, bu.
Chicago	25,831,000	2,242,000
Duluth	2,922,000	.....
Milwaukee	575,000	.....
Detroit	1,540,000	4,000
Toledo	3,334,000	23,000
Buffalo	1,877,000	147,000
Total	36,079,000	2,416,000

At the points named there is a net increase for the week of 699,000 bushels of wheat, and a net increase of 280,000 bushels of corn.

Capt. John Gaskin of Kingston is reported as saying with reference to the action of the waterways convention at Toronto that it would take all the money in the Banks of England, the United States and Canada, to do the work as suggested by the convention, and then it would be impracticable for ocean steamers. In considering anything that Capt. Gaskin might say on this subject, however, it must be remembered that his personal interests are with the Kingston and Montreal Forwarding Company, and he is as much opposed to a radical enlargement of the St. Lawrence system of canals as are the elevator interests of Buffalo,

Number and Tonnage of Vessels Owned on the Lakes.

On June 30, 1894, the number of vessels of all kinds on the lakes was 3,341 of 1,227,400.72 gross tons. These figures are official, as they are furnished by Mr. Eugene T. Chamberlain, United States commissioner of navigation, from tables that will be contained in the statistical part of his annual report. Statistics relative to the ownership of vessel property on the lakes are taken from the report of the commissioner of navigation each year and published in the REVIEW, but in the past we have been unable to obtain them until about December following the close of the treasury department's fiscal year on June 30. This year Mr. Chamberlain has kindly granted a request for the figures in advance of their publication in his report. The number and tonnage of the different classes of vessels, as well as the number and tonnage of vessels owned in each customs disrict on the lakes, are shown in the following summaries:

TONNAGE OWNED ON THE GREAT LAKES.

Class.	At close of year ending June 30, 1894.		At close of year ending June 30, 1893.	
	Number.	Gross tons.	Number.	Gross tons.
Steam Vessels	1,731	843,239.65	1,731	828,702.29
Sail Vessels	1,139	302.985.31	1,205	318,789.37
Canal Boats	386	41,961.25	743	76,843.57
Barges	85	39,214.51	82	37,731.99
Totals	3,341	1,227,400.72	3,761	1,261,067.22

TABLE SHOWING NUMBER AND TONNAGE OF VESSELS OWNED IN THE SEVERAL CUSTOMS DISTRICTS ON THE LAKES.

Customs Districts.	Number.	Gross Tons.
Cuyahoga	259	234,733.76
Buffalo Creek	351	177,991.75
Port Huron	455	171,628.63
Detroit	271	161,845.83
Milwaukee	393	93,766.75
Chicago	305	83,713.57
Champlain	331	33,552.97*
Marquette	159	68,088.90
Sandusky	99	48,433.68
Grand Haven	289	34,753.49
Erie	55	36,596.99
Oswegatchie	49	23,530.61
Oswego	52	9,467.18*
Toledo	75	20,743.29
Niagara	27	12,872.21
Vermont	38	5,509.02
Genesee	21	1,779.41
Cape Vincent	52	3,803.57
Duluth	56	4,500.52
Dunkirk	4	88.59
Total	3,341	1,227,400.72

* Mostly canal vessels; decrease, as compared with 1893, largely due to withdrawal of canal boats from trade with Canada and to closer correction of records.

It will be noticed that both in number and tonnage the lake fleet is reported slightly smaller than it was a year ago. Now it is not true that the number of vessels lost during the year was greater than the number built, but in the preparation of the tables this year a great many canal boats, small sailing vessels and other worn out craft that should not be carried on the books of the department have been excluded.

The Steamship Great Britain.

Editor MARINE REVIEW.—Col. E. A. Stevens has sent me your letter to him, dated the 22d inst. The article from the magazine and Mr. Chestnut's communication* are both substantially correct. Fifty years ago, the term "direct acting" was applied to engines having their connecting rods leading from the cross heads to the cranks, directly, and without the intervention of the lever beam.

Information respecting the Great Britain can be obtained from a series of twenty-four plates, 14½ by 21½ inches, published by John Weal, London, 1847, and entitled "The Great Britain, Atlantic Steamship of 3,500 Tons, Constructed of Iron, and With the Screw Propeller." A further account can be found in Capt. Clayton's pamphlet, Bristol, 1845, and also in the Artizan, (magazine), London, of about that period. A good engraving of the vessel is shown in the frontispiece of the second volume of Tomlinson's Cyclopedia, 1853.

Two of the four 88-inch cylinders of the original engine were placed on each side of the vessel with their bottoms against the bilge and with their center line inclined to intersect the center line of the main shaft, which was placed in line of the keel, and 17½ feet above the screw shaft, to which it was geared, three to one, by a chain belt. The pistons of the forward pair of engines were connected to a crank on the forward end of the shaft, and those of the after pair to the crank on its after end. By this means an equable motion was secured, as the cranks were so arranged that each of the four pistons was at the end of its stroke at a different time. The chain belt was identical with the bicycle belt now in use, with the exception that the projections were on the links instead of being on the wheel. The belt was perfectly reliable. The links were 12 inches long, 1½ inches square at the center, the pins and eye holes being 2 inches in diameter. The maximum strain at the center of the link was 4,200 pounds and at the eye holes 2,500 pounds per square inch. On the Great Eastern, Brunel wisely placed the screw engine cranks on the screw shaft, discarding the chain belt and its successor, the cog-wheel gearing.

The intermediate screw shaft was hollow, 32 inches in diameter, 65 feet long and connected at the crank and screw ends with shafts, each 16 inches in diameter. The main engine shaft, its two cranks, and their crank pins, were also hollow. The bore of the engine shaft was 10 inches in diameter, that through the cranks 3 inches, and that through the crank pins 2 inches. The rudder was equipolent, having about one-fourth of its surface forward of the center line of the rudder post. The workmanship, throughout was excellent, and the vessel with her original machinery—had her coal consumption warranted it—might have been kept in commision up to the present time, for her model was excellent. The great defect of the original engine was its enormous consumption of coal, amounting to 8 or 9 pounds per indicated horse power per hour; for the rule, emphatically laid down by Watt, that the pressure of steam should be barely above the atmosphere, was adhered to, and the actual gain by any attempted expansion amounted to little or nothing. Although the Great Western and Great Britain both had an expansion gear, it was only used to throttle the steam in rough weather. She had the ordinary syphon mercury gauge, placed in plain sight on the deck beam at her engine hatch, and the maximum pressure that I observed when I was on board of her, as mentioned below, was 3 pounds per square inch, the highest graduation on the scale being 5 pounds.

When the engines mentioned by Mr. Chestnut were put into her, a very much higher pressure was maintained; the steam was used expansively, and the vessel became the best screw steamer then built, and maintained a high reputation for years. Although wooden screw ships of war about one-fifth of the tonnage of the Great Britain had been built in America, England and France previous to 1845, the Great Britain can be justly called the forerunner of the Atlantic screw steamers. But much more than that can be said of her. She was the vessel that demonstrated to the world the strength of ships built of iron. On Sept. 22, on her way to New York, with a full compliment of passengers and a large cargo of freight, she ran ashore at full speed at night in Dundrum bay, Ireland. The accident occurred a few hours after leaving Liverpool, and was generally attributed to an error in the adjustment of the compass. Yet, although she was left stranded until August 27, 1847, so great was her strength that it was said "she sustained little damage from the shock, or from the waves rolling over her for nearly two years."

The general confidence in iron vessels, and their gradual substitution for wooden ones, can be said to date from the test that the hull of the Great Britain endured. The Great Britain was designed by the younger Brunel, who shortly after floating her at Dundrum bay commenced the design of the Great Eastern, and it was this great engineer who led the way in changing the ships of the world from wood to iron and steel.

I was frequently on board of the Great Britain in the summer of 1845, while she lay at the pier near the foot of Pike street, New York, and when she left, her commander, Lieut. Haskins of the Royal Navy, invited my father and myself, who wished to test her speed, to go on her down the bay. We remained on her until she got outside of Sandy Hook, and we were taken off with the pilot. There was no wind and her maximum speed was a trifle over 13 statute miles an hour, but as she was full ship sparred and rigged her speed at sea must at times have been much greater.

FRANCIS B. STEVENS,

HOBOKEN, N. J., Oct. 2, 1894.

*In MARINE REVIEW of Sept. 20, 1894.

The River Steamer Unique.

With quadruple expansion engines and tubulous boilers furnishing steam at high pressure, some very fast runs on the Detroit and St. Clair rivers were expected of the passenger steamer Unique, owned by the McElroys of St. Clair, and which went into commission a few weeks ago. Since the newspapers in and around Detroit published statements reflecting on the boat and her construction, immediately after she had met with a series of mishaps on trial, nothing has been heard of her, bnt the owners are making no answer to anything that has been said, and they are probably of the opinion that when they are ready to speed the boat it will not be necessary to talk or take anything back. A gentleman interested in the Unique says:

"The fact is that on the trials it was impossible to get dry steam from the boilers, as they worked water to the engines in such quantities that several break-downs resulted. Then, just when this difficulty was being overcome, two tubes blew out and scalded a fireman to death. The boat is now at the dock of the Frontier Iron Works, Detroit, and has had her boilers thoroughly overhauled, and advantage is being taken of the opportunity to make some changes in her machinery and piping arrangements, which it was intended to put off until winter, as the boat was in shape for service all right as they were. The boat will do all her owners have expected her to do in speed, as has been shown several times for short stretches when the boilers were gotten down to business."

Failure of the Coal Combination-Freight Matters.

Numerous conditions combined to defeat the vessel owners who had entered into an agreement to take no Lake Superior coal at less than 50 cents. Contracts, whether made before or after the agreement was entered into, were the principal source of trouble, but back of this feature was the fact that there was not the amount of coal to go forward that was figured on, and the number of owners outside of the combination who sought coal cargoes at the 45 cent rate was greater than was expected. This is shown by the shipments during September, which aggregated in round numbers, according to the St. Mary's Falls canal report, 553,000 tons, an amonnt greater than has ever before been shipped in any one month, excepting August just preceding. With about 1,500,000 tons of soft coal already forwarded to Lake Superior and with ore shipments from all ports to Oct. 1 footing up 5,950,000 gross tons, or 1,078,000 tons more than on the same date a year ago, it is evident that freights must depend largely on grain for the balance of the season.

Coal Shipments—Gain of a Million in Ore.

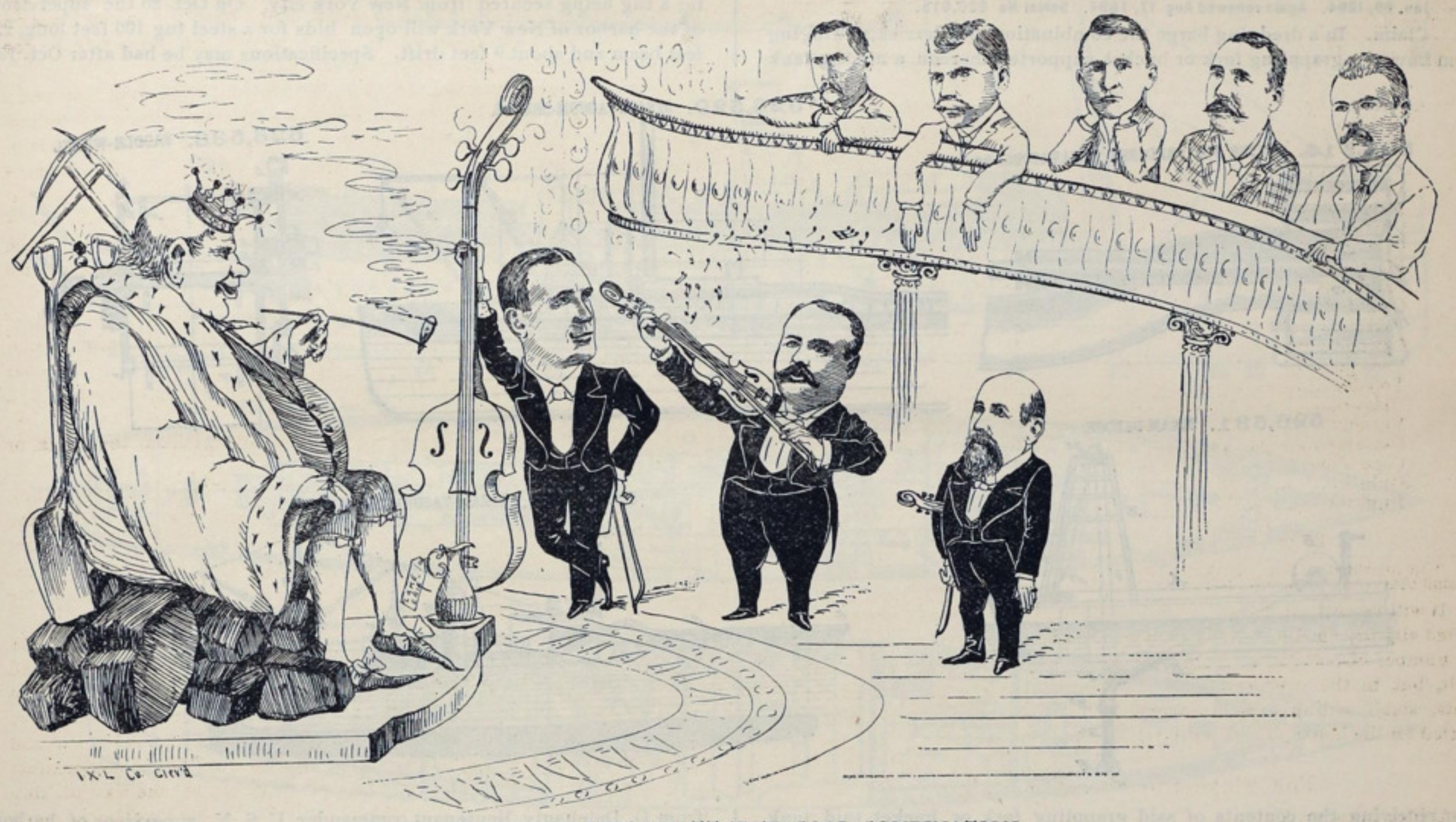
Soft coal shipments through St. Mary's falls canal to all Lake Superior ports during the month of September aggregated 552,930 net tons, and the movement of ore eastword foots up 930,740 gross tons, against only 510,316 gross tons during September, 1893. These figures, although appearing in advance of the full statement, are correct, as they were furnished by telegraph upon request made to Gen. Supt. Wheeler, who is in charge of the engineer office at the canal. They tend to indicate the wonderful business being carried on this season between Lake Superior and lower lake ports.

The figures covering soft coal shipments are especially interesting. They show that notwithstanding the agreement of Cleveland owners to hold out for a 50-cent rate on all Lake Superior coal, the movement during the month when the agreement was supposed to be in effect, was almost as large as during any previous month in the history of the canal. Shipments of soft coal from the opening of navigation to Oct. 1 aggregate 1,487,757 net tons. This is almost equal to the figures fixed upon by the coal shippers for the full season. Soft and hard coal shipments together up to Oct. 1 foot up 1,849,820 net tons, against 2,296,142 net tons on the same date in 1893. For the full season of 1893 the shipments of soft and hard coal combined amounted to 3,008,120 net tons, while for the full season of 1892 they were 2,904,266 net tons. Unfortunately shipments of the two kinds of coal for seasons previous to the present one can not be separated. The movement of coal through the canal by months is shown in the following table:

COAL SHIPMENTS THROUGH ST. MARY'S FALLS CANAL BY MONTHS, TO OCT. 1, SEASONS OF 1894 AND 1893.

Months.	1894. Bituminous.	1894. Anthracite.	1893. Bituminous and Antheacite
April	31,052	27,398	.....
May	16,372	52,123	390,792
June	12,300	108,220	492,397
July	227,061	58,141	618,021
August	648,042	42,431	420,593
September	552,930	73,750	374,339
	1,487,757	362,063	2,296,142

Reduced to gross tons, the shipments of iron ore from all ports on Lake Superior up to Oct. 1 show a gain of 1,838,059 tons over the shipments on the same date a year ago. The figures are 4,684,681 gross tons so far in 1894, against 2,846,622 gross tons at the same time a year ago. As the entire movement of ore from ports on Lake Superior during the full season of 1893 amounted to only 3,584,425 gross tons, the movement thus far this season is 1,100,256 gross tons ahead of the full season of 1893. But from Lake Michigan the shipments, of course, show a large decrease. On Oct. 1, 1893, shipments from Escanaba and Gladstone amounted in round numbers to 2,025,000 gross tons; on the first of the present month they were, according to a reliable source of information, in round numbers, 1,265,000 tons. Thus we have to Oct. 1 this year from Lake Superior ports 4,685,000 gross tons and from Lake Michigan ports 1,265,000 gross tons, which is 1,078,000 tons more than was shipped from all ports at this time a year ago.



APROPOS OF THE SHATTERED COAL COMBINATION.

Old King COAL
Was a merry old soul,
A merry old soul was he—
He called for his pipe
And he called for his bowl
And he called for his fiddlers three.

A bulletin relative to the character and movements of the West Indian cyclone, which visited the southern coasts during the past week, has been issued by the weather bureau and copies of it may be had from observers at leading lake ports. The exceptionally destructive nature of many of these storms has prompted the weather bureau to a special study of their characteristics and habits, and the information collected regarding them makes interesting reading.

Illustrated Patent Record.

SELECTED ABSTRACTS OF SPECIFICATIONS OF A MARINE NATURE—FROM LATEST PATENT OFFICE REPORTS.

526,514. CUTTER FOR DREDGERS, EXCAVATORS, ETC. Lindon W. Bates, Chicago, Ill. Filed March 13, 1894. Serial No. 503,435.

Claim. First, a cutter for excavators, dredging machines, etc., having knives with cuttin g edges at both ends, whereby it may be reversed end for end. Second, in combination with a fixed suction pipe, a reversible cutter, a cutter-operating shaft having a seperate conical casting thereon, and an open-ended funnel axially in line with the casting and suction pipe.

526,529. STEAM VACUUM DREDGE. Levi Hussey, New York, N. Y., assignor to the Mining and Dredging Power Company of West Virginia. Filed Sept. 2, 1892. Renewed March 30, 1894. Serial No. 505,779.

Claim. The combination of an open comminuting tank, an open mixing tank in communication with said comminuting tank, a comminuting mechanism in said comminuting tank, means for supplying water to both of said tanks, an excavator, and a suction pipe leading from the mixing tank.

526,530. STEAM VACUUM DREDGE. Levi Hussey, New York, N. Y., assignor to the Mining and Dredging Power Company of West Virginia. Filed Apr. 5, 1892. Renewed Jan. 29, 1894. Again renewed Aug 17, 1894. Serial No 520,615.

Claim. In a dredging barge the combination of a derrick,a swinging arm having a grappling fork or bucket supported thereon, a mixing tank for receiving the contents of said grappling fork or bucket, said tank being provided with lateral channels on a level with the water line, and gates in said channels for regulating the supply of water to and from the tank.

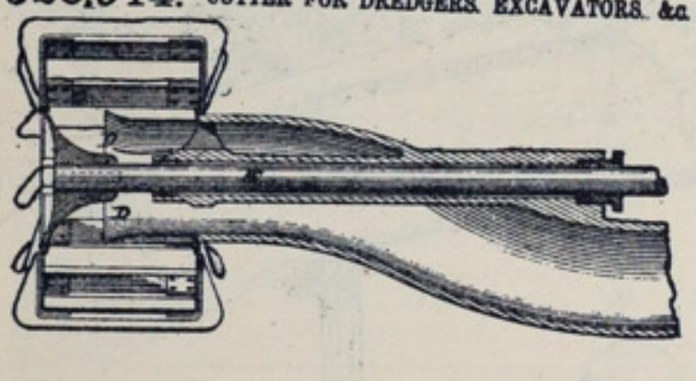
526,531. STEAM DREDGE. Levi Hussey, New York, N. Y., assignor to the Mining and Dredging Power Company of West Virginia. Filed Apr. 5, 1892. Renewed July 15, 1893 Again renewed Jan. 29, 1894, and again renewed Aug. 17, 1894. Serial No. 520,616.

Claim. The combination, with a barge having a longitudinal center-opening, a pump on said barge, a vertically-swinging suction pipe passing through said opening, a lower vertical section connected by a flexible joint with the main section of the suction pipe, a collar guided on the lower section, a grappling-fork suspended from said collar, chains applied to the guide-collar and fork respectively, a derrick on the barge provided with guide-pulleys for said chains and a winding drum on which said chains are wound in opposite direction, so that by the alternate turning of the drum in one or opposite direction the raising or lowering of the guide-collar and the opening or closing of the grappling-fork is produced.

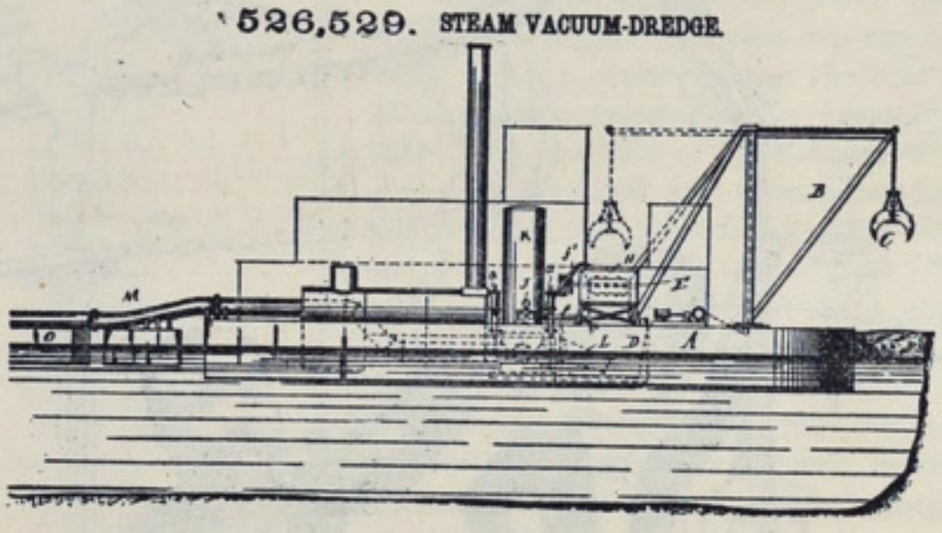
526,533. PADDLE-WHEEL FOR BOATS. William H. Knapp, Galesburg, Mich. Filed June 6, 1894. Serial No. 513,663.

Claim. A paddle-wheel, comprising the two axles on different planes eccentric to each other, one of said axles having a right-angle integral projection forming a bearing-support to the inner end of the other axle, two wheels rigidly attached to the latter named axle, one in close proximity to each end-bearing of said axle, the spokes of said wheels being straight, and those of the inner one of said wheels being in such close proximity to the right-angle projection as to just clear the same when the wheel revolves, paddles pivoted in the outer end of the paddle-wheel-spokes by axles, said spokes being provided with an inner boss, and the paddles having notches to receive said bosses, a paddle-controlling-wheel having straight spokes and revoluble on its axle in such close proximity to the integral projection as to just clear the same when revolving, and cranks connecting the axles of the paddles with the outer end of the spokes of said wheels.

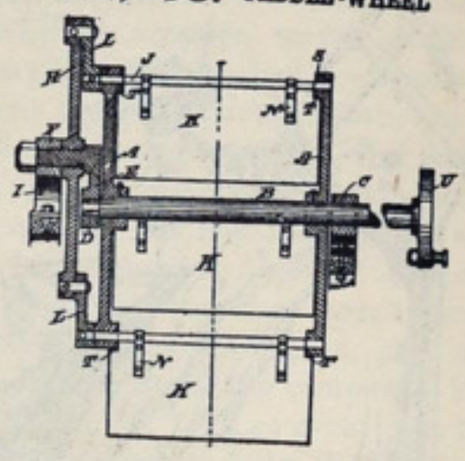
526,514. CUTTER FOR DREDGERS, EXCAVATORS, &c.



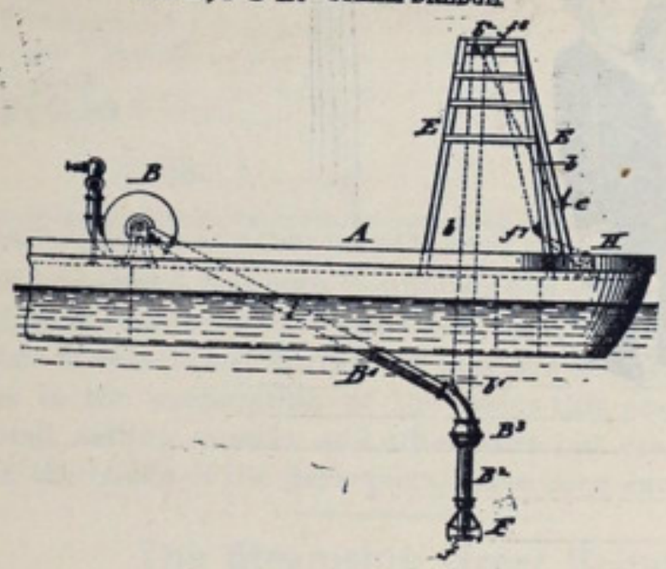
526,529. STEAM VACUUM-DREDGE.



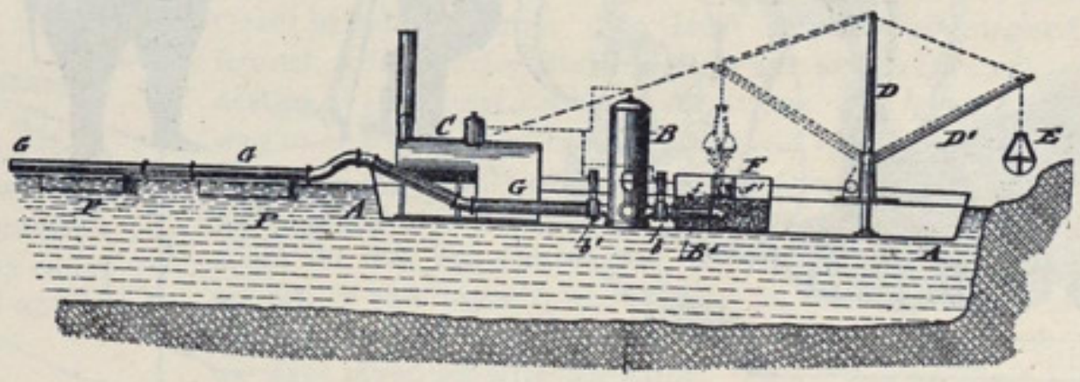
526,533. PADDLE-WHEEL



526,531. STEAM-DREDGE.



526,530. STEAM VACUUM-DREDGE.



Trade Notes.

Boston is to have another fire boat. The hull will be built by John M. Brooks of East Boston, and the engines by the Vulcan Iron Works of Jersey City.

Crawley & Johnson of Cincinnati have closed a contract with Capt. T. J. Wood of Pittsburg for a "Cincinnati" steam steering gear for the steamer Ed. Roberts.

There is a machine shop for sale at Ashtabula Harbor, O., in the best location for marine work. More ore is received at the Harbor than at any other lake port, and a profitable repair business ought to be built up there in a short time. Write H. T. Raser, Ashtabula, O.

An effort on the part of some lake builder might result in a contract for a tug being secured from New York city. On Oct. 25 the supervisor of the harbor of New York will open bids for a steel tug 100 feet long, 22 feet beam and about 9 feet drift. Specifications may be had after Oct. 15, from D. Delehanty, lieutenant commander, U. S. N., supervisor of harbor of New York, Room A8, No 39 Whitehall street, New York, N. Y.

In General.

Yarrow, the builder of English torpedo boats, has lately given $600,000 for a hospital for convalescent children at Broadstairs.

Crews of the big Cunard ships Campania and Lucania each comprise 423 hands, divided into three departments—officers and sailors, 54; engineers and firemen, 190; steward's department, 179.

Notwithstanding the depression in shipping on the other side, Great Britain adds about as much new tonnage to its register each month as is built in this country in a whole year. British board of trade statistics for August show that during the month additions to the register numbered seventy-one vessels of 73,314 gross or 47,237 net tons. Of these, thirty-four were steel steamers of 57,862 gross tons and eight were iron steamers of 4,225 gross tons.

Experiments with a new form of torpedo net cutter are being carried out at the submarine mining station of Bramsnas, Denmark, under the direction of the Danish minister of marine. The "torpedo scissors," as the appliance is called, are the invention of a Danish naval officer. They are fixed at the head of the torpedo, and their action depends on its speed. Having effected a breach in the net the scissors fall aside and allow the torpedo to pass on and strike the ship's side. The experiments are stated to be so far successful, and the invention is regarded as hopeful.

Light-draft, 20-knot Screw Steamer.

A 20-knot twin-screw passenger steamer of 270 feet length, 34 feet beam and only 14½ feet moulded depth is a novelty. It has repeatedly been held on the lakes, in cases where fast twin-screw steamers were derised, but where side-wheelers were substituted, that the disadvantage of light draft was almost an absolute hindrance to high speed in large screw steamers. Owners and builders on the lakes will therefore be interested in a description, from Engineering of London, of the twin-screw steamer Seaford, built for the channel service between Newhaven and Dieppe in connection with the London, Brighton & South Coast Railway and the Western Railway of France. There are two French-built twin-screw steamers on this service but the last British-built boat for the line were paddle, and before departing from this established practice the railway managers requested Professor Biles to give them a report upon the question of the type of boat which best suited all the requirements of their traffic. As a result of this report, it was decided to adopt the twin screw in preference to the paddle, and Professor Biles was instructed to design a vessel suitable for the passenger service, and having a speed of not less than 20 knots on a length not exceeding 270 feet, and on the minimum draught at which a vessel can enter the harbor at Dieppe at low water. The contract was undertaken by William Denny & Bros. of Dumbarton, Scotland, who built the ship, guaranteeing all the results required. The speed contracted for was such that the mean of the times taken to pass from Newhaven to Dieppe, and from Dieppe to Newhaven, should be not more than 3 hours 15 minutes. The speed trials took place recently, the mean time being 3 hours 12 minutes. This result is equivalent to a mean speed of 20.15 knots.

The vessel, as noted, is 270 feet long by 34 feet beam by 14 feet 6 inches moulded depth, and a special instruction to the naval architect was that comfort was in no way to be sacrificed to speed. This involved the necessity of doing everything to avoid vribration in the vessel. and with a view to this, four-cylinder engines of the tripple expansion type were adopted. These engines are run at over 200 revolutions per minute. To reduce rolling as much as possible, the vessel has been provided with bilge keels 18 inches deep. These bilge keels formed the subject of an elaborate investigation, and were only adopted after prolonged trials in the builders' experimental tanks, to ascertain the power of preventing rolling and their effect upon resistance.

The appearance of the ship as well as the arrangement of cabins etc., are well indicated by the engravings. One of the difficulties common to vessels carrying large numbers of passengers is to stow the life-belts in a position that is convenient in case of disaster, and which at the same time does not take up otherwise valuable space. This difficulty has been overcome in the Seaford by building a long but narrow house at the after end of the promenade deck in which to stow the life-belts, and on each side of this house are placed seats for passengers (Fig 4). This erection forms what is most valuable in a passenger vessel—a long length of lee side for shelter, without the top weight involved in a deck-house.

There are four single-ended boilers, fired from a common stokehold worked under forced draught on the closed stokehold system. The boilers are fitted with Serve tubes, and work at 160 pounds pressure. The twin-screw engines have each four cylinders, one of 23 inches, another of 36 inches, and two of 38 inches in diameter, with a stroke of 27 inches. They are all built throughout of the material usual in the lightest class of machinery. The engines are shown on plans Figs. 2 and 3. It is scarcely necessary to say that the vessel is built with special refeience to quick maneuvering.

Fig 1.

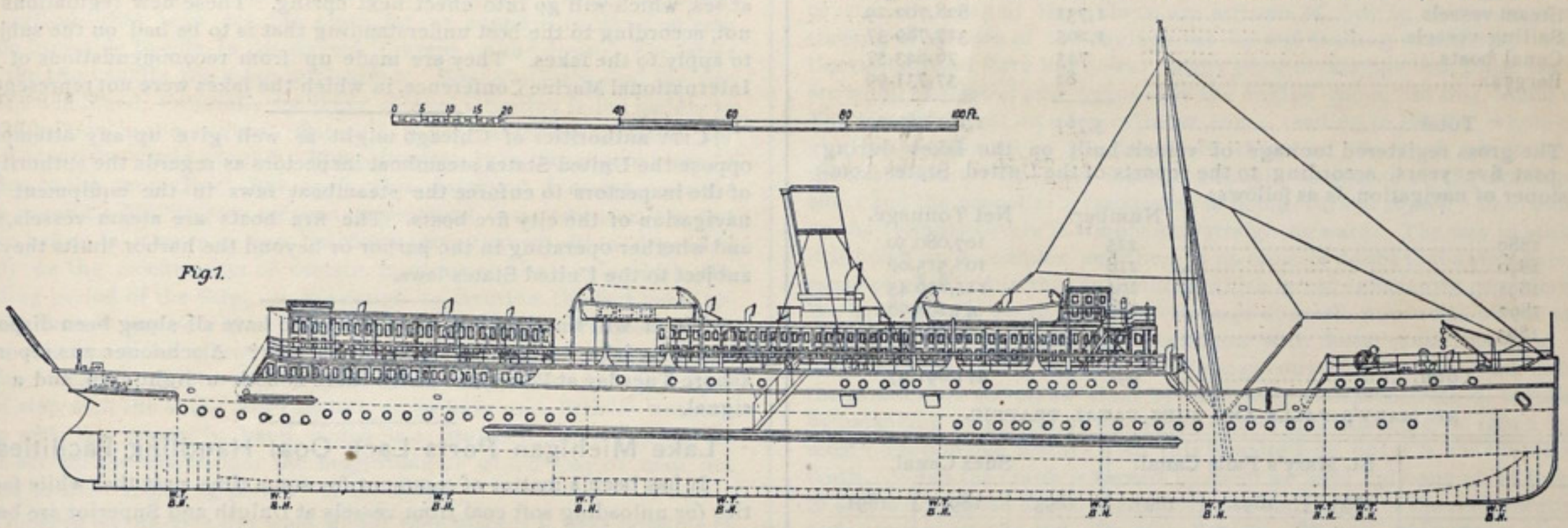


Fig. 2. Main Deck.

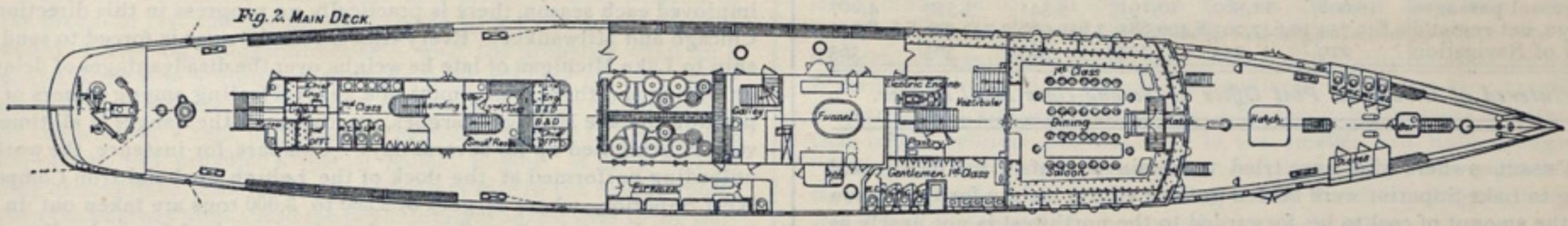


Fig. 3 Lower Deck.

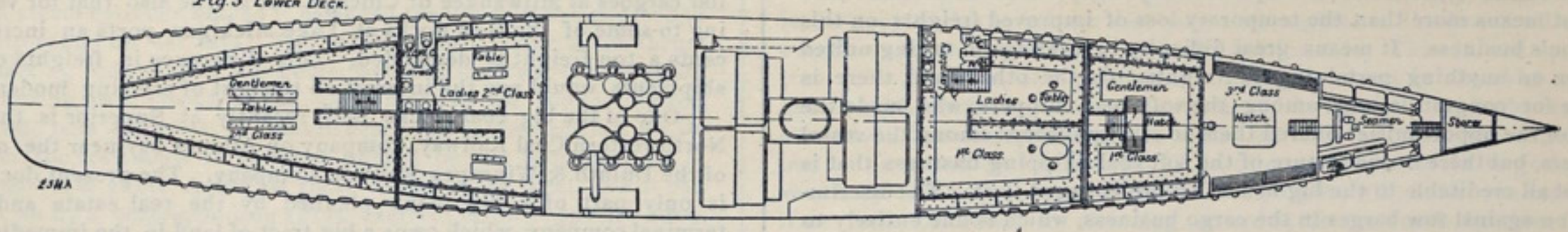
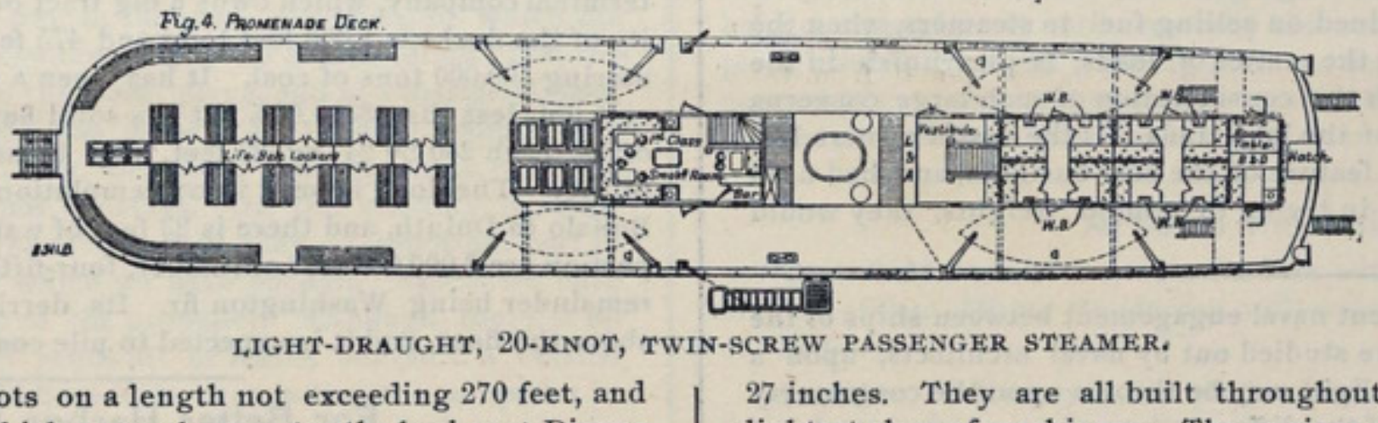


Fig. 4. Promenade Deck.



LIGHT-DRAUGHT, 20-KNOT, TWIN-SCREW PASSENGER STEAMER.

Messrs. Hulse & Co., British manufacturers, have designed several machines for drilling marine boiler shells up to 18 feet diameter by 20 feet long, having rivet holes up to 1½ inches or more in diameter. In these machines the shell lies horizontally upon eight rollers, which are provided with power gearing, for the purpose of revolving the shell in either direction, and it is operated upon by four drill spindles, each carried by an independent horizontal radial arm, mounted upon a long slide bed running parrllel with the axis of the boiler. The slides carrying the drill spindles are adjustable along their respective radial arms in order to command a suaface around the periphery of the boiler of 2 feet to 2 feet 6 inches, and after the holes embraced in such a length have been drilled, the boiler is revolved by the gear and a fresh surface presented to the drills.

MARINE REVIEW.

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O.

SUBSCRIPTION—$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,761 vessels, of 1,261,067.22 gross tons register in the lake trade. The lakes have more steam vessels of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of steam vessels of 1,000 to 2,500 tons on the lakes on June 30, 1893, was 318 and their aggregate gross tonnage 525,778.57; in all other parts of the country the number of this class of vessels was, on the same date, 211 and their gross tonnage 314,016.65. The classification of the entire lake fleet on June 30, 1893, was as follows:

Class.	Number.	Gross Tonnage.
Steam vessels	1,731	828,702.29
Sailing vessels	1,205	317,789.37
Canal boats	743	76,843.57
Barges	82	37,731.99
Total	3,761	1,261,067.22

The gross registered tonnage of vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	Number.	Net Tonnage.
1889	225	107,080.30
1850	218	108,515.00
1891	204	111,856 45
1892	169	45,168.98
1893	175	99,271.24
Total	991	471,891.97

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

	St. Mary's Falls Canal.			Suez Canal.		
	1893.	1892.	1891.	1893.	1892.	1891.
No. vessel passages	12,008	12,580	10,191	3,341	3,559	4,207
Ton'ge, net regist'd	9,849,754	10,647,203	8,400,685	7,659,068	7,712,028	8,698,777
Days of Navigation	219	223	225	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

VESSEL owners who have tried to obtain 50 cents a ton on all coal going to Lake Superior were beaten in their efforts mainly for the reason that the amount of coal to be forwarded to the northwest is not nearly as great as the owners counted upon. They have been beaten, and their defeat means more than the temporary loss of improved freights on this season's business. It means great difficulty in ever again taking united action on anything pertaining to freights. On the other hand, there is cause for congratulations among the soft coal shippers, who made the best of the opportunities offered them to stir up discord among the vessel owners, but there is one feature of the soft coal shipping business that is not at all creditable to the big firms that are engaged in it. The discrimination against tow barges in the cargo business, which is due entirely to the small margin of profit obtained on selling fuel to steamers, when the latter are given preference in the matter of loads, is picayunish in the extreme, and should be beneath the consideration of such large concerns as are engaged in this branch of the lake trade. If the vessel owners had united in opposing this unjust feature of the coal business, and had used half the effort that was shown in trying to uphold freights, they would have been successful.

WHEN DETAILS of the recent naval engagement between ships of the Japanese and Chinese navies are studied out by naval architects, upon a line of correct reports, some light may be thrown upon the controversy regarding the relative merits of the different types in modern vessels of war, but as yet information is so meager as to cause little attention to be paid to various views that have been expressed, but which have brought out nothing startling. The warring nations have but five ironclads each and those of Japan are not formidable armored ships, but both have fleets of unarmored vessels of fair proportions, the number of Japanese cruisers being greater and the ships larger than those of the Chinese. The claim, therefore, that the navies of the two countries are not large enough, and that the fight is between the wrong parties to demonstrate the advantages or disadvantages of armored protection, is hardly well founded. It would seem from the dispatches, which are confined to accounts of awful scenes of death aboard the ships, that the recent engagement was marked by some of the horrors predicted for modern naval warfare. One writer expresses the opinion that if European rulers could have seen the decks of a few of the ships that were in the fight they would have foresworn war henceforth and forever.

AFTER all the fuss that was made by the citizens of Toronto over the recent waterways convention, the board of trade of that city is now found considering the question of disapproving of the recommendations of the convention and urging the dominion government to speedily complete the St. Lawrence canals in accordance with the 14-foot plan on which the work is now being very slowly carried on. It is claimed that the convention was captured by United States delegates from the west, and the western delegates wanted entirely too much. It was, of course, understood immediately after adjournment of the convention that the Canadian delegates were disappointed in finding that delegates from the United States would not support the St. Lawrence route to the seaboard as against any of the proposed routes through United States territory, and this is very probably the cause of the change of feeling in Toronto, and the desire to have the dominion government hurry along the work of completing a system of canals of limited draft.

CUSTOMS officers on the lakes are distributing circulars containing the president's proclamation regarding the law for preventing collisions at sea, which will go into effect next spring. These new regulations are not, according to the best understanding that is to be had on the subject, to apply to the lakes. They are made up from recommendations of the International Marine Conference, in which the lakes were not represented.

CITY authorities of Chicago might as well give up any attempt to oppose the United States steamboat inspectors as regards the authority of of the inspectors to enforce the steamboat laws in the equipment and navigation of the city fire boats. The fire boats are steam vessels, and and whether operating in the harbor or beyond the harbor limits they are subject to the United States laws.

WHAT will the light-house officers, who have all along been disposed to criticise lake navigators, think of us now? A schooner was reported ashore Tuesday at Poe's reef where there is both a light-ship and a fog signal.

Lake Michigan Ports Lack Coal Handling Facilities.

It has been a matter of comment for some time past that while facilities for unloading soft coal from vessels at Duluth and Superior are being improved each season, there is practically no progress in this direction in Chicago and Milwaukee. Every time a vessel owner is forced to send his ship to Lake Michigan of late he weighs over the disadvantages of delay in unloading and there ie no doubt of a general feeling among owners of opposition to Lake Michigan cargoes, on account of the danger at all times of vessels being tied up for several days. Compare, for instance, the work of unloading performed at the dock of the Lehigh Coal and Iron Company, West Superior, where cargoes of 2,500 to 3,000 tons are taken out in ten to twenty hours, against three or four days required for unloading similar cargoes at Milwaukee or Chicago. It is true also that for vessels going to some of the slow docks at Lake Michigan ports an increase of 5 cents a ton freight is demanded. This difference in freights on heavy shipments would pay the interest on the cost of erecting modern plants.

One of the big coal docks built recently at Superior is that of the Northwestern Coal Railway Company on Allouez bay near the ore docks of the Duluth & Winnipeg Railway Company. The present dock, which is only part of a big plant planned by the real estate and railway terminal company, which owns a big tract of land in the immediate vicinity of the docks,is 1,000 feet long and 475 feet wide and will be capable of storing 500,000 tons of coal. It has been a year in construction, and has cost not less than $300,000. It is a solid sand dock, held by four timber cribs, each 250 by 24 by 23 feet, and these carefully guarded by close piling. The dock is built in contemplation of the 20-foot channel from Buffalo to Duluth, and there is 23 feet of water alongside. In the present portion are 5,000,000 feet of lumber, four-fifths of which is white pine, the remainder being Washington fir. Its derricks, runways,etc., are 38 feet above the floor, and it is expected to pile coal 30 feet deep.

For Better Harbor Facilities.

Business men of Cleveland seem to be thoroughly in earnest in the matter of carrying out the plans proposed by the chamber of commerce and leading city officials, for widening, straightening and deepening the Cuyahoga river. At an open meeting of the city council on Wednesday evening, leading members of the chamber of commerce were present and the subject of better harbor facilities was fully discussed. Among the gentlemen making formal addresses were Mr. Luther Allen, Harvey D. Goulder, Esq., James H. Hoyt, Esq., and W. M. Day, all of whom have an extensive acquaintance with the subject. Plans and estimates are to be prepared and an effort will be made to secure funds from the city for carrying out the work.

Some Plain Points on Vibration.

Much has been written and said concerning the vibration of steamships, its causes and its remedies, but even now much remains to be said, and there are few subjects connected with naval architecture and engineering so little understood. We say this, of course, while giving Mr. Yarrow full credit for the work he has done in investigating the subject. But Mr. Yarrow directed his attention mainly to one type of vessel. The nature of the subject is such, however, that while it admits of specialization, it demands generalization. The principles involved are but imperfectly understood, and, indeed in many respects overlooked.

In the first place, the word "vibration" is not properly defined. A particular passenger vessel is said to vibrate so badly that she is wretchedly uncomfortable. If we ask how she vibrates, we are told, "Why, in the usual way, of course!" Now, as a matter of fact, not only are there more kinds of vibration than one, but two or more of them may be found in different parts of the same ship at the same time; and until we know what the character of the vibration is, it is waste of time to attempt to prevent it. Speaking at large, vibration in a ship is of two kinds, lateral and vertical—that is to say, the stern, let us suppose, in the first case swings from side to side, in the second it jumps up and down. The latter is of the two usually the more unpleasant. We constantly find the two motions combined. Generally speaking, vertical vibration is due mainly to want of balance in the engine. But this is not invariably the case, nor does it cover the whole ground. Side vibration is in like manner generally due to the propreller. But, again, this statement does not cover the whole ground. Mr. Yarrow reduced to practical demonstration the fact known before in a more or less indefinite way, that vibration depended largely on the isochronism of certain motions of the engine with the vibrating period of the ship. It is enough to mention the fact here, because it has not any very close connection with what we are about to advance. No doubt the vibration of a ship may be reduced or augmented in many instances by altering the speed of the engines so as to put them out of step with the ship. But this has, as we have said, little or nothing to do with the matter in hand, which is a consideration of the forces which set up the vibrations, the magnitude of which may or may not depend on the "vibrating period" of the ship.

To begin let us consider what would take place if it were possible to hold the propeller fast and permit the engines to work. In that case the ship would revolve on a longitudinal axis, with the propeller shaft for a centre; and although nothing of the kind takes place in practice, none the less is the effort there. In the well-known cigar ship—which being a spindle and without a keel, depended on her ballast alone to prevent her rotation—there was provided a special ballast engine. A mass of lead weighing about fifteen tons was hung pendulum wise in the engine room, and when the engines went ahead the pendulum was thrust over to the starboard, and when they went astern it was thrust over to port by a piston in a horizontal steam cylinder, and so it balanced the effort of the engines to turn the ship round on her axis. The turning effort is due to the thrust of the connecting rods against the guide bars, and it varies continuously in amount during each stroke, as the angle made by the connecting rod with the guide bars augments or diminishes. The thrust depends for its existence on the resistance to rotation offered by the propeller. It is clearly a transverse effort acting at right angles to the keel, and it can only be set up by a corresponding effort exerted in the opposite direction, or by two or more efforts not in the same direction, of which the effort in the guide bars is the resultant. It by no means follows that the two opposing efforts must be in the same plane, and as a matter of fact, one is at the screw propeller and the other in the engine room, fifty, a hundred, or more feet apart. If, now, the effort were constant, it would not cause vibration. But it is not constant. On the contrary, it is extremely variable, and beyond question it may play an important part in causing that lateral vibration of which we have spoken. Again, we have to take into account the action of the propeller. Although there is no proof whatever that a propeller sends aft or leaves behind it a twisted rope of water as some writers believe, it is certain that the propeller in its revolution will throw water violently against the stern post and the rudder, and the succession of blows thus given, blade by blade, is very well calculated to set up lateral vibration in the stern of the ship, especially if she is weak. The influence of the propeller is, however, so well understood that it is not necessary to insist upon it. But it is necessary to insist on the influence of the reactions which go on continuously in the engine room, and which have nothing whatever to do with balancing the reciprocating parts. They are, as we have said, of the nature of a horizontal thrust, constantly rising and falling in amount, and this thrust is very well calculated to cause lateral vibration when combined with the effort of the propeller. In stiff ships it is not so prominent in its effect as in weak ships. In certain high-speed vessels with thin shells and weak frames, in which much if not everything, has been sacrificed to save weight, the lateral vibration is often excessive, rendering the ship very uncomfortable. It is said that the twin-screw ships are better off in this respect than those with single screws, because the effects of the engines revolving in opposite directions neutralize each other, and no doubt there is force in this contention. The engines in such ships never make precisely the same number of revolutions per minute except by chance. Lateral vibration does occur now and then, but on the whole the twin-screw gives immunity, provided, which is not always the case, that the proprellers are accurately balanced. This balancing of propellers does not have nearly the attention which it deserves. It is forgotten that the tips of the blades often make sixty miles an hour or even more, and while a hundred pounds of metal more or less in the blade of the screw may seem a trifle, that weight moving at the rate of forty of fifty miles an hour can cause a great deal of trouble.

A great deal has been written on the subject of balancing engines, but we must insist on the fact that, while engines out of balance are are pretty certain to cause trouble, it by no means follows that putting them in perfect balance will put an end to vibration. It is quite easy to put balance weights on an engine that will do more harm than good. But this is not all. There is another agency at work which tends powerfully to set up vertical vibration. We refer to the steam efforts on the cylinder covers. On each of these there are stresses of five to thirty tons, according to the size of the engines, set up and tending alternately to lift the ship up and force her down. Many persons assume that these efforts are wholly balanced and opposed in the engine room, but this is not so. The upward thrust on a top cylinder cover tending to lift the whole engine is not balanced by the downward thrust on the crank pin, save at the dead point. We have instead a couple composed of the crank pin effort and the propeller's resistance to being turned round. The effort on the cylinder covers is simple and straightforward. The way in which it is taken up is complex, and there is no room to doubt that a very potent cause of vibration is thus introduced which is not sufficiently considered. We have then in every steam vessel, large or small, numerous efforts and stresses, which have nothing in common with those caused by want of balance in the matter of weight. We may construct a model, and cause the rotation of the crank shaft by hand, and so demonstrate at will that by balancing we get rid of vibration, and by not balancing we retain that most objectionable feature. All this is quite true, but it is not the whole truth. When the crank is turned by hand we have only one set of forces to deal with—those due to the momentum and inertia of the reciprocating and rotating parts. But the case is quite different when steam is put into the cylinders. It is not different as regards the engines, but it is different as regards the ship. An excellent illustration of what we mean is furnished by outside cylinder locomotives. No matter how carefully they are balanced they always have a tendency to run more unsteadily than inside cylinder engines, and in the smaller and lighter engines "boxing" is always very apparent at certain speeds. The engines are thrown from side to side at the leading end by the alternating effort of the steam first on one cylinder cover and then on the other.

In conclusion we may say that there is too much tendency manifested in the present day to believe that balancing engines will suffice in all and every case to make passenger steamers comfortable. This is not quite true. For example, the position of the engine room in the ship may have a marked effect. Thus, as a rule, to which there are no doubt many exceptions, the nearer the engines are to the mid length of the ship the less is the vibration likely to be. It is, of course, impossible to go here very fully into a subject so abstruse. Our purpose will have been served if we have succeeded in directing attention to the truth that want of balance in engines is not necessarily the only reason why vibration takes place, and it is worth noticing that the actual rate at which vibration goes on is not always the same or nearly the same as that at which the pistons reciprocate.—The Engineer, London.

Around the Lakes.

Capt. C. H. Henderson, who was lost with the schooner Home, was a brother of Capt. Hiram Henderson of Cleveland and was very well known on the lakes.

Corrigan, McKinney & Co. of Cleveland are negotiating for a lease of the Crystal Falls iron mine. The ore is low in iron, but if favorable terms can be obtained it is probable that the mine will again be operated.

MR. H. STEPHENSON SMITH, marine agent of the Sun Insurance Company of San Francisco, announces that Mr. Richard E. Rispin, late general agent for the Sun, is no longer connected with that company.

The superior court of Montreal two years ago granted to the Richelieu & Ontario Navigation Company $20,000 insurance on the burned steamer Corinthian. The company appealed and last Saturday was awarded by the court of appeals the full amount claimed, $40,000, with two years' interest and the costs taxed to the insurance companies, of which there were sixteen interested.

"A DOLLAR SAVED IS A DOLLAR EARNED."

Results Obtained from the Application of

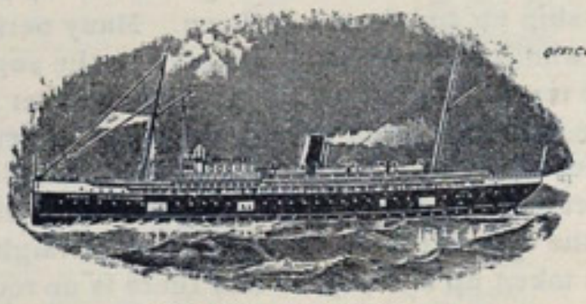
Howden's Hot Draft System

On the PASSENGER STEAMER VIRGINIA, (See Letter Below,)
And on the Coarse Freight Carrying STEAMER HARVEY H. BROWN,

Show an immense saving in fuel. A ton of cargo carried a mile on 8-10 of an ounce of fuel, or a ton of cargo carried 170 miles at the rate of 13.2 miles per hour on a cent's worth of fuel, are performances that have been attained on but one steamer on the lakes—that steamer is the HARVEY H. BROWN fitted with **HOWDEN'S HOT DRAFT SYSTEM.**

"A Tale of a Smoke Stack of a Modern Lake Steamer."

Sent FREE to any Address.



OFFICE OF THE PRESIDENT.

GOODRICH TRANSPORTATION Co

FOOT OF MICHIGAN AVENUE.

A.W. GOODRICH, PRESIDENT

Chicago Dec. 20th, 1893.

Frank E. Kirby, Esq.,
c/o Detroit Dry-Dock Co.,
Detroit, Mich.,

Dear Sir --

In reply to your letter of the 18th inst. inquiring about the results of the Howden System of Forced Draught now in use on our S. S. "Virginia", will say that since it has been in use we have had steady steam, and burned slack coal, which costs us $1.10 per ton less than the coal we were forced to use before we introduced the Howden System.

At the same time we applied the Forced Draught we also supplied the "Virginia" with new Condensing apparatus built by the Knowles Co., which gives a better vacuum requiring much less steam to operate than the original plant supplied by the builders.

Our saving in the price of coal has been 50 o/o. We attribute 33 1/3 o/o of the saving to the Howden System, in enabling us to burn a cheaper grade of coal and maintain steady steam.

The balnace or 16 2/3 o/o we credit to the Condensers made by the Knowles Co.,

We are so well satisfied with the results on the "Virginia" that we have since fitted the "Atlanta" with the Howden System and are now putting it in the "City of Racine," and "Indiana."

Very truly yours
A.W. Goodrich Pres.

"A Tale of a Smoke Stack of a Modern Lake Steamer."

Sent FREE to any Address.

For further particulars, write the sole owners and manufacturers of the Howden apparatus for the lakes.

THE DETROIT DRY DOCK COMPANY,

SHIP AND ENGINE BUILDERS, **DETROIT, MICH.**

P. S.—**"A cent's worth of fuel, A ton of cargo, A hundred and seventy miles, At 13.2 miles per hour"** is the title of a book being prepared for this company. If you would like a copy, send your name and address.

MARINE REVIEW LINER EXCHANGE.

Space under this heading may be used gratis by our advertisers or subscribers to call attention to vessels or any craft, machinery, new or second hand, that they may have for sale. Those wanting machinery of any kind or wishing to purchase vessels, are invited to take advantage of the same offer. Employers in need of professional men or men who want positions may avail themselves of the opportunities offered. Each item will be limited to three lines. Letters concerning same must mention number attached to item and be addressed MARINE REVIEW, 516 Perry-Payne Building, Cleveland, O.

255—WANTED—Second hand naphtha launch that will carry about 25 passengers.

257—FOR SALE—Cheap; new Simmerly derrick.

258—WANTED—To buy a tug for spot cash. Not less than 20 square nor more than 22. Give full description and bottom cash price.

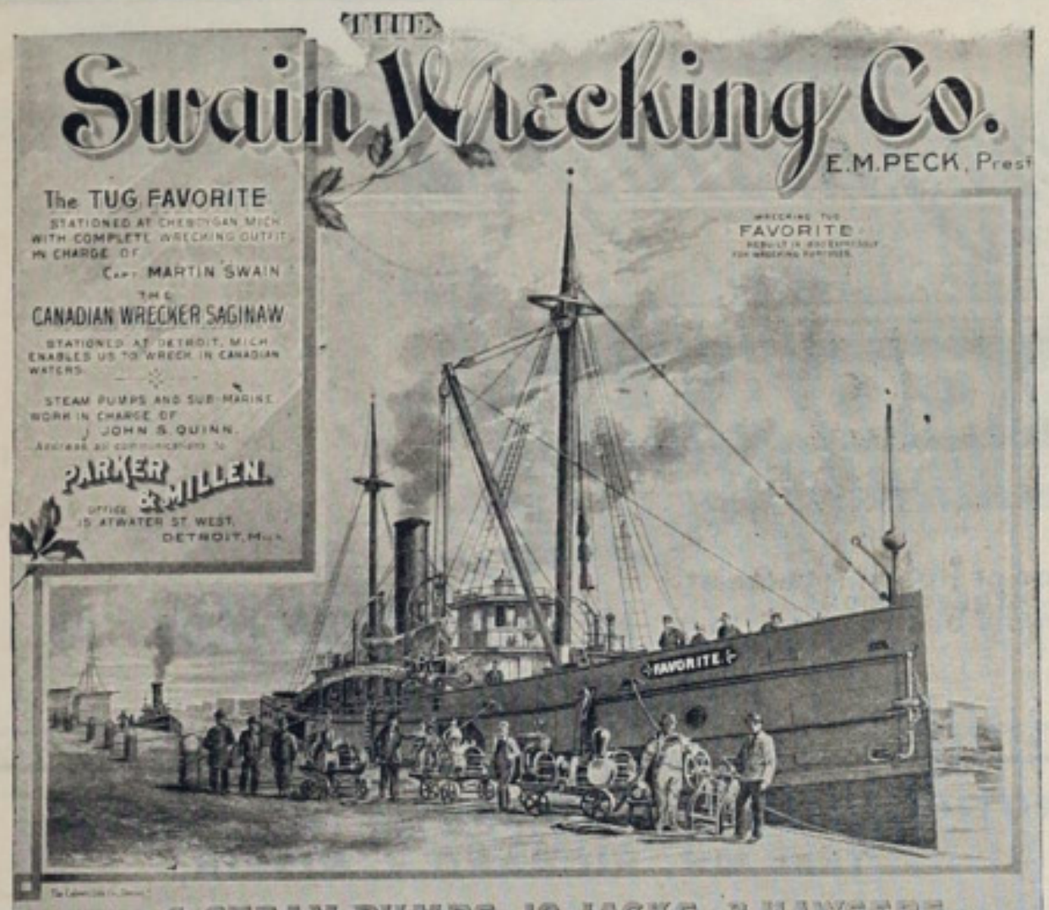
259—FOR SALE—Tug 100 feet long, 20 feet beam and 56 tons net, built of Delaware oak; diagonal knees and galvanized fastenings. Equipped with powerful compound engines. Boat now in service in Philadelphia.

260—FOR SALE—Machine shop at Ashtabula Harbor, O. Write H. T. Raser, Ashtabula, O., at once.

STERLING, WELCH & CO.

12 and 14 Euclid Ave., CLEVELAND, O.

BOAT FURNISHING A SPECIALTY.
CARPETS, OIL CLOTHS,
CURTAINS, &c., &c.
SUPPLIED AT WHOLESALE RATES.



When you want VALVES AND WANT THEM SIMPLE, STRONG AND TIGHT, EASILY AND CHEAPLY REPAIRED, AND VALVES THAT LAST ON HIGH OR LOW PRESSURE STEAM, OILS, ACID, WATER, GAS ETC.

we'll sell the JENKINS BROS. and GUARANTEE them best.

WITH OUR TRADE MARK,

JENKINS BROS., New York, Boston, Philadelphia, Chicago.

EDWARD C. WEAVER, LL. M.,

900 F. (op. Pat. Office.) Washington, D. C. Attorney and Counsellor in Patents, Trade Marks, Revenue Claims and all claims against the U.S. Make a clear statement of your invention or claim, and I will advise you free of charge. Send stamp for my phamphlet.

PATENTS.

FRANK L. DYER,

918 F. Steet,
Washington, D. C.

References: American Steel Barge Co.; Capt. Alexander McDougall.

U. S. ENGINEERS OFFICE, 34 West Congress street, Detroit, Mich., September 12, 1894,—Sealed prposals for furnishing all labor, materials and appliances, and removing shoals of boulders, both bedded and loose, and other material, from vicinity of Ballard's Reef in Detroit river, will be received here until 2 p. m., standard time, October 12, 1894, and then publicly opened. All information furnished on application. O. M. POE, Col., Corps of Engrs.
Oct 4

A remarkable reduction in rates has been made to points in the west for Sept. 25 and Oct. 9. Ask agents of Nickel Plate road. 154-8

Home Seekers' Excursion—Sept. 25 and Oct. 9. Ask agents of Nickel Plate road. 153-8

FRANKLIN HOUSE

Cor. Bates & Larned sts. only a block from Woodward & Jefferson Aves., **DETROIT, MICH.** THOROUGHLY RENOVATED. Very central. Per day, $1.50. H. H. JAMES.

A copy of the 50-cent North West edition will be mailed to any one sending a $2 subscription within 30 days to the
MARINE REVIEW,
516 Perry-Payne Bldg., Cleveland O.

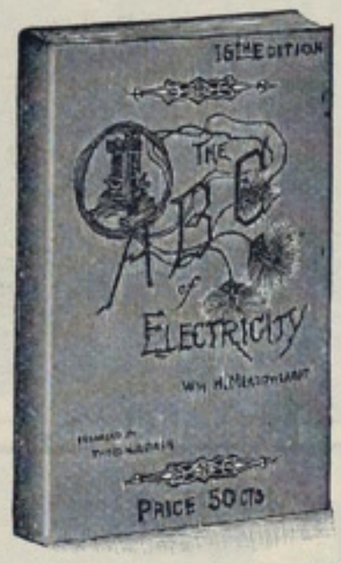
PATENTS

Promptly secured. Trade-Marks, Copyrights and Labels registered. Twenty-five years experience. We report whether patent can be secured or not, free of charge. Our fee not due until patent is allowed. **32 page Book Free.**
H. B. WILLSON & CO., Attorneys at Law, Opp. U. S. Pat. Office. **WASHINGTON, D. C.**

ABC OF ELECTRICITY

By WILLIAM H. MEADOWCROFT

Endorsed by THOS. A. EDISON.



WHAT THE PRESS SAYS.

"A clear and comprehensive little treatise."—*N. Y. Sun.*

"Electric Science is making magnificent strides and this book fills a useful office in setting forth the features and characters of these advances."—*Brooklyn Times.*

"The need of such a book has undoubtedly been felt by many . . . we predict for it a splendid sale."—*The Age of Steel.*

"A book like this should be largely read."—*N. Y. Herald.*

"The book is well illustrated, and no pains have been spared to make it accurate and reliable throughout."—*Electrical Review.*

"In simple language, the author lays bare the secrets of electrical science and application."—*Electrical World.*

"A vast amount of useful importance."—*Washington Post.*

FROM THE LABORATORY OF THOS. A. EDISON,
ORANGE, N. J., Sept., 24, 1888.

DEAR SIR—I have read the MS. of your "A B C of Electricity," and find that the statements you have made therein are correct. Your treatment of the subject, and arrangement of the matter, have impressed me favorably.

Yours truly,
THOS. A. EDISON.

PRICE, 50 CENTS.

MARINE REVIEW, 516 Perry-Payne Bldg.,
CLEVELAND, OHIO.

P. M. CHURCH & CO.,

SAVINGS BANK BLOCK, SAULT STE. MARIE, MICH

LEADING DEALERS IN

Ship Chandlery,

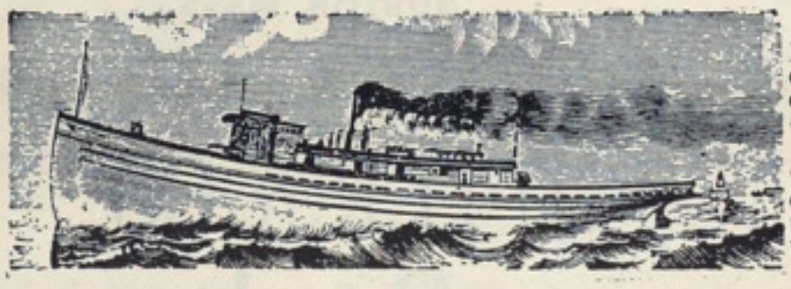
Marine Hardware, Paints, Oils, Packings, Cordage, Etc.

FIRST-CLASS COPPERSMITH AND TINSHOP IN CONNECTION.

H. A. HAWGOOD, President. PHILIP MINCH, Vice-President. GEO. ELSEY, Jr., Gen. Mgr. J. A. SMITH, Sec'y. J. R. SPRANKLE, Treas.

The Cleveland Tug Co.

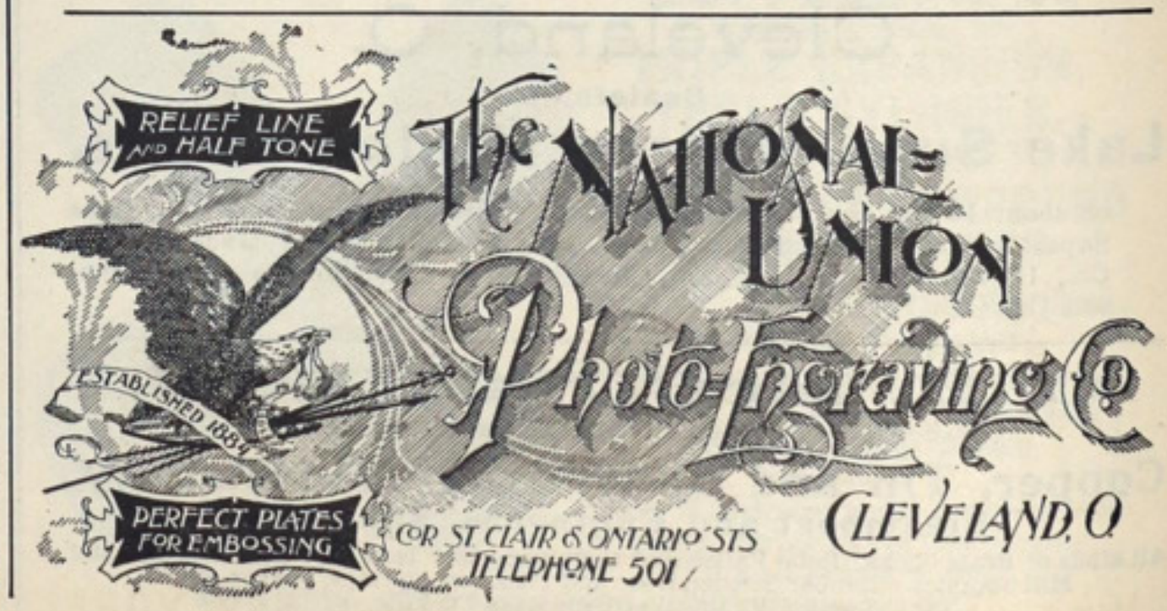
FIRST-CLASS TUGS,



Steam Pumps, Divers, Hawsers, Lifting Screws, etc., furnished promptly on orders by telegraph or otherwise.

Steamers when outside wanting our Tugs, blow one long whistle and as many short ones as they want Tugs.

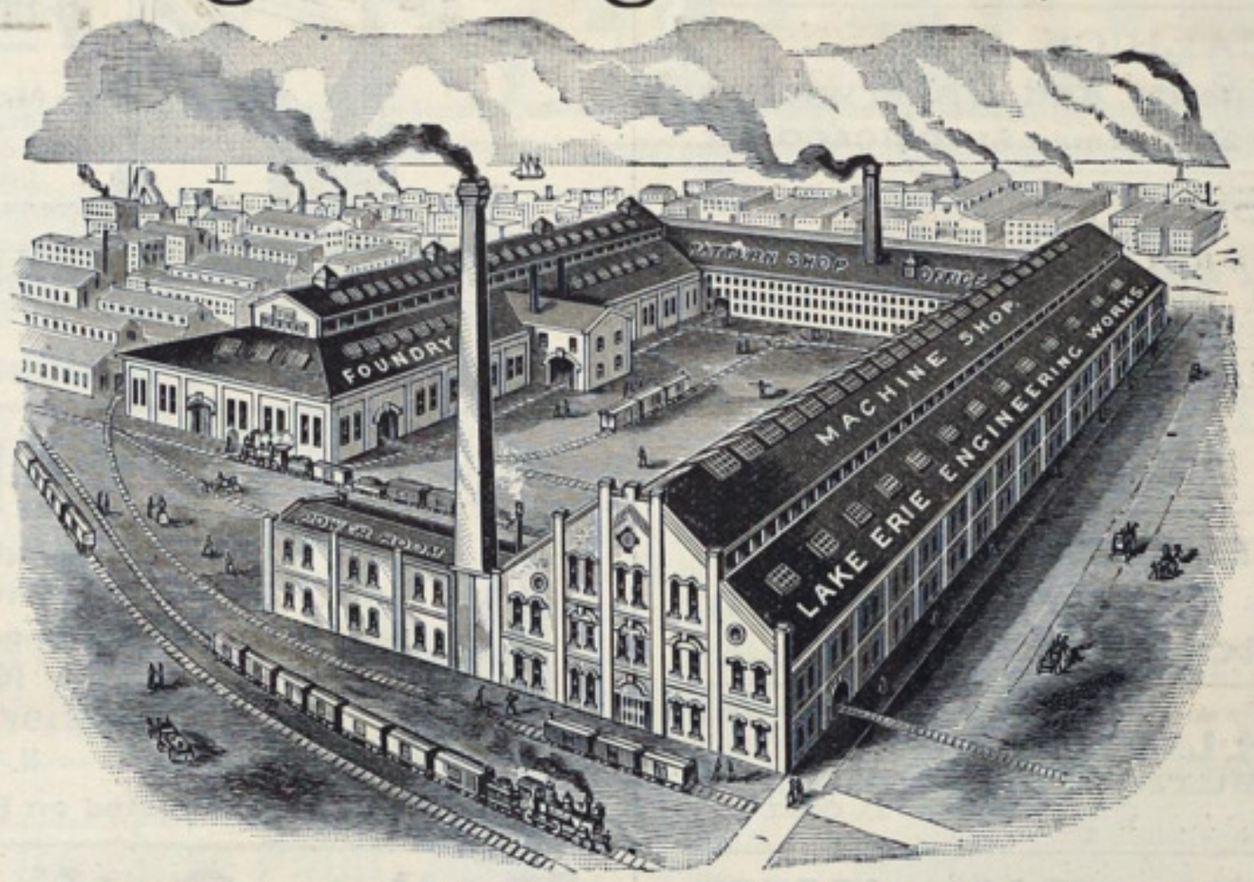
Office, Open Day or Night, East End Main St. Bridge,
Long Distance Telephone 919. CLEVELAND, OHIO.



Lake Erie Engineering Works, Buffalo, N. Y.

RICHARD HAMMOND, Pres't. JOHN COON, Sec'y and Treas.

Steam Engines, Compound, Triple and Quadruple Expansion Engines, From 250 to 10,000 Horse Power For Marine and Stationary Service.



Special Designs for Cable Railways and Electric Power Plants.

The Best Economy and Regulation Guaranteed.

THE BEST EQUIPPED PLANT IN AMERICA.

The Chase Machine Co.

111 ELM ST., CLEVELAND, O.,

...MACHINISTS AND ENGINEERS...

MANUFACTURERS OF

LAND AND MARINE ENGINES and STEAM PUMPS,

SOLE OWNERS AND MANUFACTURERS OF

Chase Fog Whistle Machine.

Over 150 in use on the best class of Lake Steamers.

Special Attention given to Marine Repair Work.

ENGINEERS' SUPPLIES.

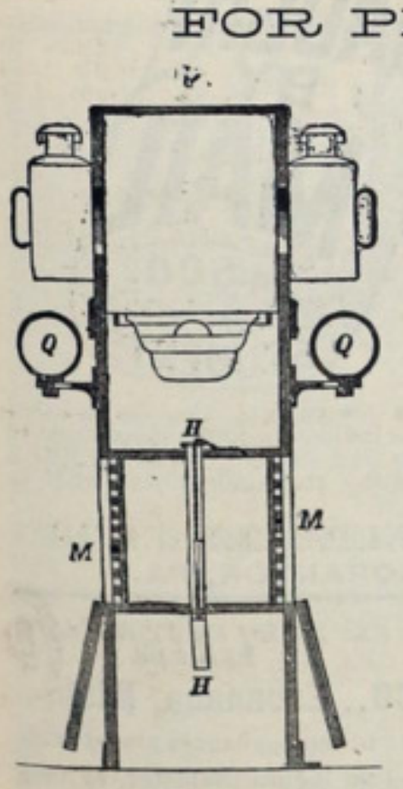
ASBESTOS PIPE AND BOILER COVERING. TELEPHONE 994.

DO YOU? *attach importance to the economy that reaches down to touch the* smaller items *of your Expense Account? True, it may perhaps involve only a* few dollars *in any one year, but in the selection of your* **STEAM PACKING,** *you can make those* "few dollars" still fewer *by confining your purchases strictly to the best made, viz.:* **Genuine "Eureka" Steam Packing.** *Send for Sample to* **HINE & ROBERTSON,** No. 8. *Our List of Prizes interests all Engineers.* **40 Cortlandt Street, New York.**

PATENT ADJUSTABLE

BINNACLE and COMPASS

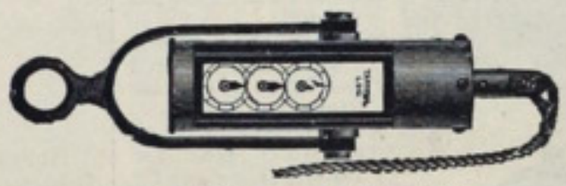
FOR PILOT HOUSES.



With Directions for Adjustment.

SEND FOR CIRCULAR.

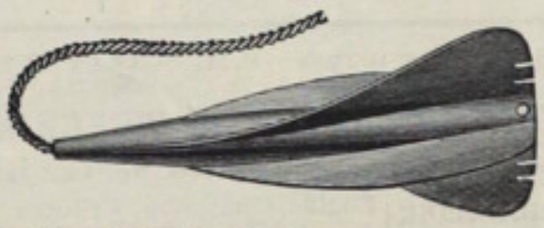
..TAFFRAIL LOG..



WITH ADJUSTABLE ROTATOR.

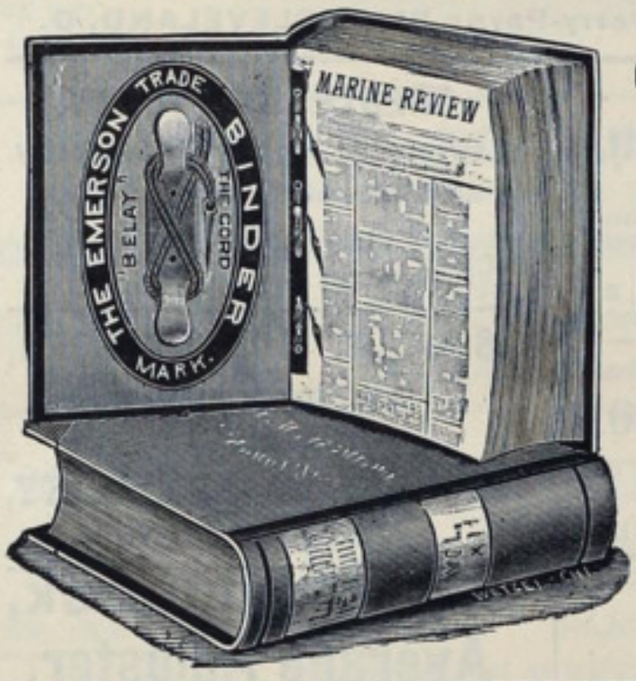
BEST LOG IN THE MARKET.

THOUSANDS IN USE.



MANUFACTURED BY

JOHN BLISS & CO., 128 Front Street, NEW YORK.



ONE OF THESE BINDERS

that will hold 52 NUMBERS of the

MARINE REVIEW,

Will be mailed to any address on receipt of $1.

MARINE REVIEW...

516 Perry-Payne Bldg., CLEVELAND, O.

U. S. ENGINEER OFFICE, 366 Milwaukee street, Milwaukee, Wis,, Oct. 1, 1894. Sealed proposals for: Green Bay Harbor, Wis., dredging 200,000 cubic yards; Kewaunee Harbor, Wis.. pile pier extension 325 feet; Manitowod Harbor, Wis., construction of breakwater 400 feet; Sheboygan Harbor, Wis., pile pier construction 900 feet; will be received here until 12 o'clock noon, Nov. 1, 1894. and then publicly opened. All information furnished on application. JAMES F. GREGORY, Major, Engrs. 11-1

U. S. ENGINEER OFFICE, 366 Milwaukee street, Milwaukee. Wis., Oct. 1, 1894. Sealed proposals for: Harbor of Refuge Milwaukee, Wis., extending breakwater 300 feet; Racine Harbor, Wis., pier extension 150 feet; Kenosha Harbor, Wis., pier extension 150 feet; Waukegan Harbor, Ill., pile pier extension 240 feet; will be received here until 12 o'clock noon, Nov. 6, 1894, and then publicly opened. All information furnished on application. JAMES F. GREGORY, Major, Engrs. 11-2

FOR SALE

(CHEAP IF SOLD THIS FALL)

STEAMYACHT LUCILLE

FIVE YEARS OLD.

Length, 66 ft. Beam, 12 ft. Draft, 5 ft.

Compound Engine, 8″ and 15″ by 10″. Dean's Air Pump and Condenser.
Smith's Patent Pipe Boiler (built 1892) 6 ft. x 5½ ft. 20 square ft. grate area.
Pressure allowed, 200 lbs. 2 Pumps. Bunker capacity, 6 tons.
Schooner rigged. Pilot House and Cabin of Cherry.
Sleeping accommodation for 9 Passengers, besides Crew.
Hull of Oak. 2 Dingeys, Anchors, etc.
Fully equipped, in running order, allowed 25 Passengers.

FOR PRICE, ADDRESS DETROIT BOAT WORKS, Detroit, Mich.

Take No. 6.—For Buffalo, New York and Boston, it is the fast train east on the Nickel Plate road and carries through palace buffet sleeping cars. 156-8

Try No. 5.—Fast Nickel Plate train for Chicago and all points west.

HARVEY D. GOULDER,
LAWYER AND PROCTOR IN ADMIRALTY,
CLEVELAND, O.

W. H. COOK.
CAPT. J. A. CALBICK.
J. B. CLOUGH.

COOK, CALBICK & CO.
Vessel Agents and Underwriters.

Tel., Main, 56. RIALTO BLDG., No. 23 Sherman St., CHICAGO, ILL.

H. R. SPENCER,
ATTORNEY AT LAW and PROCTOR IN ADMIRALTY.
218 Superior St., DULUTH, MINN.

C. E. KREMER, *Attorney and Counselor-at-Law and Proctorin Admiralty.*

Rooms 14, 15 and 16, Bryan Block, - - 164 LA SALLE ST., CHICAGO, ILL.

HARVEY L. BROWN,
Attorney at Law and Proctor in Admiralty,
Buffalo, N. Y.

JOHN MITCHELL. JOHN F. WEDOW. ALFRED MITCHELL.

MITCHELL & CO.,
Vessel and Insurance Agents,
508, 509 and 510 Perry-Payne Building, CLEVELAND, OHIO.
Office Telephone, 737. Reidence, John Mitchell, 3506.

C. R. JONES & CO., VESSEL AGENTS,
FIRE AND MARINE INSURANCE.
Nos. 501, 502 and 503 Perry-Payne Bldg., CLEVELAND, O.

W. M. HAYDEN,
Lawyer and Proctor in Admiralty,
Depositions and Testimony
Taken as a Notary or under a commission. Legal business and collections promptly attended to.
1007 Soc. for Sav. Bldg., CLEVELAND, O.
Telephone 2297.

C. A. Macdonald. J. J. Rardon.
C. A. MACDONALD & CO.
General Insurance Agents,
RIALTO BUILDING, CHICAGO, ILL

H. S. LORD. J. H. NORTON.
LORD & NORTON,
Attorneys-at-Law, Proctors and Advocates in Admiralty,
DULUTH, MINN.

White, Johnson & McCaslin,
ATTORNEYS-AT-LAW,
—AND—
Proctors in Admiralty,
26-27 Blackstone Building,
CLEVELAND, - OHIO.

THOS. WILSON,
MANAGING OWNER
WILSON'S TRANSIT LINE.
Gen. Forwarder.
Freight and Vessel Agent.
CLEVELAND, O.

C. F. Palmer. Chas. Hutchinson.
P. J. Minch.
PALMER & CO.,
Vessel Owners and Agents,
(John H. Palmer and Jonn T. Hutchinson, Associates.)
Perry-Payne Bldg., Cleveland, O.

W. A. HAWGOOD. C. C. CANFIELD.
HAWGOOD & CANFIELD,
Vessel Agents and Marine Insurance,
604-605 Perry-Payne Bldg.,
Cleveland, - Ohio.
Telephone No. 2395.

GEO. D. FELLOWS,
VESSEL AGENT,
Fire & Marine Insurance.
Cargoes a Specialty.
WHOLESALER OF SALT.
RACINE, WIS.

ORESTES C. PINNEY,
Lawyer and Proctor in Admiralty.
Rooms 722 and 723 Perry-Payne Bldg.
CLEVELAND, OHIO.
Telephone 2585.

ISAAC N. HUNTSBERGER,
ATTORNEY-AT-LAW,
—AND—
PROCTOR IN ADMIRALTY,
TOLEDO, OHIO.

E. T. HITCHCOCK,
Average Adjuster,
184 Main St.,
BUFFALO, N.Y.

H. J. WEBB & CO.
SHIP BROKERS, VESSEL OWNERS and AGENTS,
Established in 1856. H. J. Webb & Co. will charter vessels for the lake trade. Special attention given to chartering vessels in the Lake Superior Iron Ore trade, both for the season and single trip.
No. 606 & 607 Perry-Payne Building, Cleveland, O. Office Telephone No. 338, Residence No 3228.

J. T. ROSE. FRANK B. LAZIER.
ROSE & LAZIER,
Vessel Agents and Brokers, and Marine Insurance,
16 Board of Trade,
DULUTH, - - MINN.

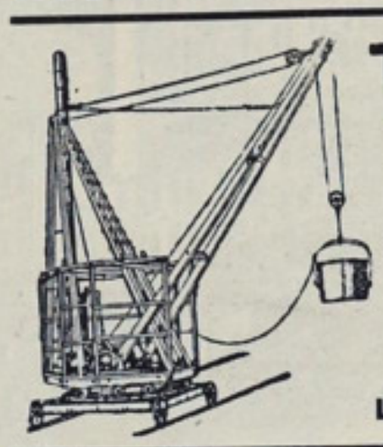
Established 1857.
THOMAS MARKS & CO.,
Merchants,
Forwarders and Shipowners,
Port Arthur, Canada.
N. B.—Special attention given to chartering vessels.

Capt. LYMAN HUNT. JAMES P. HUNT.
L. HUNT & SON,
Vessel Brokerage & Marine Insurance,
Room 9, Exchange Building.
Telephone No. 522.
No. 202 Main St., BUFFALO, N.Y.

Geo. H. Macdonell. J. J. O'Connor.
Macdonell & O'Connor,
VESSEL AGENTS AND BROKERS,
Fire and Marine Insurance.
Boats consigned to our care will receive prompt despatch.
Special attention to chartering out of Port Arthur and Fort William.
Address, PORT ARTHUR, CANADA

Pickands, Mather & Co.,

FUEL LIGHTERS AT BUFFALO, ERIE, ASHTABULA AND CLEVELAND.
At DETOUR, MICH., A FUEL DOCK equipped with Shute capacity of 600 Tons.
Best Quality PITTSBURGH COAL furnished at any time during Day or Night.
Western Reserve Building, CLEVELAND, O.



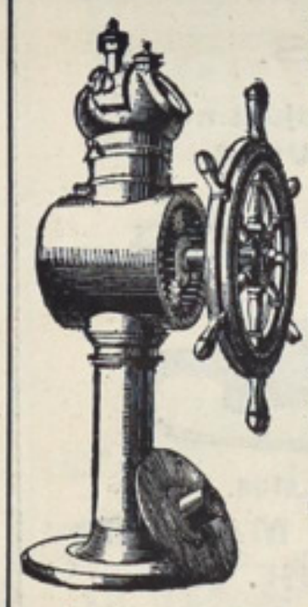
TOLEDO FUEL CO.
Cambridge, Hocking, Jackson and Massilon Coal
Wheeled on or put on with DERRICK.
NIGHT OR DAY.
SATISFACTION GUARANTEED.
H. H WILLIAMS, Manager.
Located on Penn. Dock, TOLEDO, O.

Mullen-Gatfield Coal Co.
— DEALERS IN THE CELEBRATED —
MANSFIELD AND YOUGHIOGHENY COALS.
Docks at SANDWICH, ONTARIO, opposite the Fort at Detroit, with chutes for rapid fueling.
Elevated docks and derrick at AMHERSTBURG, ONTARIO.

THE CUDDY-MULLEN COAL CO.
Dealers in COAL.
Docks at Government Pier, Whiskey Island, and Adjoining Globe Dry Dock.
All fully equipped with Revolving Derricks; also, Lighter Carrying Derrick and One Hundred Two and One-Half Ton Buckets.
Main Office, 81 Perkins Building, East Side of Main Street Bridge.
Dock Office, 127 West River St., Cleveland, O. Telephone No. 8.
Boats Coaled Day and Night. Docks at Amherstburg,

Ohio & Pennsylvania Coal Co.
FUEL DEPARTMENT.
MINERS AND SHIPPERS,
Youghiogheny and Ohio Steam Coals. Steamboats, Tugs, etc., Coaled day or night, DOCKS FOOT WEST RIVER STREET. WHISKEY ISLAND GOVERNMENT PIER and C. & P. R. R. SLIPS. Also STEAM LIGHTER—Equipped with Revolving Derrick and (100) two ton buckets.
Telephone 1608. Office, 130 West River St., CLEVELAND, OHIO.

STEAM YACHTS USE
Compound Engines
To Increase Power, and save one-third boiler capacity.
The Coulter & McKenzie Machine Co.,
P. O. Box 1127.
Bridgeport, Conn.



SNELLING'S PATENT STEERER
For Steamers, Ships, Tugs, Yachts, Coal Barges, Etc.
The drum has powerful internal gearing.
No PURCHASE BLOCKS needed.
Simple as the common "wheel and drum."
Powerful as any Screw Steerer.
An excellent relief or auxiliary gear for vessels that steer by steam.
Send for Circular.
J. H. SNELLING,
158 South Street,
NEW YORK.

MECHANICS

DIPLOMAS AWARDED. Courses in other trades, all including thorough instruction in Mathematics and Physics. Send for FREE circular, stating the subject you wish to study to
THE CORRESPONDENCE SCHOOL OF MECHANICS,
SCRANTON, PA.

H. A. BARR, PRESIDENT, Escanaba. F. H. VAN CLEVE, SEC. Escanaba. CAPT. GEO. BARTLEY, SUPT. Escanaba.
ESCANABA TOWING & WRECKING CO., Escanaba, Mich.
Tugs, Lighters, Steam Pumps, Hawsers, Hydraulic Jacks and Diving Appliances always ready.
TUG MONARCH, Engine Compound, Cylinder 16 and 30 inches diameter, 30 inch. Stroke, Steam Pressure Allowed, 125 pounds.
TUG DELTA, Cylinder 20 by 22, Steam Pressure Allowed, 105 pounds.
TUG OWEN, Cylinder 20 by 20, Steam Pressure Allowed, 104 pounds.
CENTRIFUGAL PUMPS, Seven and Fourteen Inch Suction